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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/426,644	10/25/1999	JAE-HO MOON	1349.1022/MD	2168

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EXAMINER

TUGBANG, DEXTER A

ART UNIT	PAPER NUMBER
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3729

DATE MAILED: 01/10/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/426,644

Applicant(s)

MOON ET AL.

Examiner

Dexter Tugbang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,13-17,19,21,23,24,27,30,31,38,40,42,44,45 and 47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21 and 24 is/are allowed.
- 6) ☒ Claim(s) 1,2,13-17,19,23,27,30,31,38,40,42,44,45 and 47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Prosecution Application

1. The request filed on 10/17/01 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/426,644 is acceptable and a CPA has been established. An action on the CPA follows.

Response to Amendment

2. The Preliminary Amendment (filed 10/17/01 as Paper No. 16) and After Final Amendment (filed 9/19/01 as Paper No. 13), each have fully considered, made of record and entered. ✓

Drawings

3. The applicants Formal Drawings (filed 10/25/99) with the instant application have been approved by the PTO-Draftsperson. ✓

Specification

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: A Process of Manufacturing Fluid Jetting Apparatuses. ✓

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Claim Objections

5. Claims 31 and 44 are objected to because of the following informalities: the term "type" (line 3 of Claim 31 and line 2 of Claim 44) should be removed, as this refers to "wafer type".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1, 2, 17, 19, 23, 27, 30, 31, 38, 40, 42, 44, 45 and 47 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In each of Claims 1, 17, 27, 31 and 45, the recitations that the nozzle part, membrane and heat driving part are adhered as a "continuous piece" (lines 6-7 of Claim 17, line 8 of Claim 27, lines 3-4 of Claim 45) or as a "continuous wafer" (line 6 of Claim 1, lines 4-5 of Claim 31), are new matter. The applicants specification, as originally filed, does not provide support for the fluid jetting apparatuses being formed with the nozzle part, membrane and heat driving part, as a continuous piece or continuous wafer. The applicants' specification does not even define the recitations of "continuous piece" or "continuous wafer".

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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9. Claims 1, 2, 13-17, 19, 23, 27, 30, 31, 38, 40, 42, 44, 45 and 47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In each of Claims 1, 17, 27, 31 and 45, it is unclear from the disclosure what is meant by the recitation of a "continuous piece" (lines 6-7 of Claim 17, line 8 of Claim 27, lines 3-4 of Claim 45) or a "continuous wafer" (line 6 of Claim 1, lines 4-5 of Claim 31). There is a great deal of uncertainty as to what degree the shape of the nozzle part, membrane and heat driving part together, are formed as a "continuous piece" or as a "continuous wafer".

In Claim 1, the phrase of "the shape" (line 6) lacks positive antecedent basis.

In Claim 27, it is unclear from the disclosure what is meant by the recitation of "by the spinning process" (line 4), as this is drawn to the formation of the membrane on the second silicon wafer. Applicants Figures 6A-6B show one spinning process to form the nozzle part and Figures 5A-5C shown another and separate spinning process to form the membrane. However, the recitation above implies that one, single spinning process forms both the nozzle part and the membrane. How is this possible? The above recitation is misleading and confusing.

In Claim 13, the phrase "the spinning process" (lines 11-12) lacks positive antecedent basis.

In Claim 23, the phrase "the heat driving elements" (line 5) lacks positive antecedent basis. Furthermore, the phrase of the substrate of "silicon wafer" (line 4) is unclear if this is referring to the previous recitation of "silicon wafer" (in Claim 17, line 3). How many "silicon wafer(s)" are there, since the silicon wafer is removed in Claim 17?

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 31, 44, 45 and 47, as best understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Campanelli 4,878,992.

Campanelli discloses a process of manufacturing a plurality of jetting apparatuses comprising: adhering a nozzle part (channel plate 31) having nozzles 27 to a membrane (polymer layer 58) as a wafer; and adhering the membrane (polymer layer 58) to a heat driving part (heating element wafer 36) to form the fluid jetting apparatuses as a wafer, which will eventually be separated into individual fluid jetting apparatuses; and splitting the wafer of the membrane 58, nozzle part 31 and heat driving part 36 into separate fluid jetting apparatuses by dicing (as shown in Fig. 3). Each of the fluid jetting apparatuses will have at least one of the nozzles 27 (shown in Fig. 5). Insofar as understood, the wafer (shown in Fig. 1) of Campanelli comprising the membrane 58, nozzle part 31 and heat driving part 36, are considered to be a *continuous piece* or *continuous wafer* to the extent that they are integrally attached to one another prior to being split by the dicing blade 20.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 1, 2 and 38, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Campanelli and Hawkins et al Re. 32,572 (referred to hereinafter as Hawkins'572) in view of Hawkins et al 5,006,202 (referred to hereinafter as Hawkins'202).

Regarding Claim 1, Campanelli discloses the claimed manufacturing method comprising: forming a nozzle part (channel plate 31); adhering a membrane (polymer layer 58) to the formed nozzle part 31 and a heat driving part (heating element wafer 36) to form the fluid jetting apparatuses as a wafer (shown in Fig. 1), which will eventually be separated into individual fluid jetting apparatuses. Insofar as understood, the wafer (shown in Fig. 1) of Campanelli comprising the membrane 58, nozzle part 31 and heat driving part 36 are considered to be a *continuous wafer* to the extent that they are integrally attached to one another prior to being split by the dicing blade 20. NOTE: Hawkins'572 is incorporated by reference within the disclosure of Campanelli (see Campanelli at col. 4, lines 65-67).

Regarding Claim 2, Hawkins'572 teaches forming electrodes 33 and heating elements 34 on a first substrate of a silicon wafer 36 (shown in Fig. 5); forming driving fluid barriers (upper substrate 31) on top of the electrodes 33 and the heating elements 34; and forming driving fluid chambers (triangular cross-sectional grooves, see col. 7, lines 1-8) in the driving fluid barriers (upper substrate 31), to form the heat driving part 36 integrally with the nozzle part 31.

Regarding Claim 38, Campanelli further teaches splitting of the nozzle part, heat driving part and membrane, assembled together in the form of the wafer (shown in Fig. 2) by a dicing blade 20 (shown in Fig. 3) to form separate fluid jetting apparatuses.

Neither Campanelli nor Hawkins'572 teach forming the nozzle part by a spinning process.

Hawkins'202 teaches forming a nozzle part (channel plate 12 in Fig. 16) by a spinning process of spin coating layers of photoresists to etch and shape the nozzle part (see col. 6, lines 12-42). The benefits of such a spinning process leaves a precision, etched nozzle part ready to be separated into multiple fluid jetting apparatuses (see col. 3, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the nozzle part of either Campanelli or Hawkins'572 by the spinning process of Hawkins'202, to positively provide a precision, etched nozzle part ready to be separated into multiple fluid jetting apparatuses.

14. Claims 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leban 5,299,785 in view of Baise et al 4,371,565.

Regarding Claim 17, Leban discloses the claimed manufacturing method for a plurality of fluid jetting apparatuses comprising: forming a nozzle part on a wafer (dummy substrate 10); adhering the nozzle part with the wafer to a membrane (layer 12); removing the wafer 10 from the nozzle part (see Fig. 1H); and adhering the membrane 12 to a heat driving part (heater element 36) to form the fluid jetting apparatuses (see col. 7, lines 43-47). Insofar as understood, the nozzle part, membrane and heat driving part are formed as one, integral continuous piece (as shown in either one of Figures 1H, 2B or 4).

With respect to the limitations of "to be separated into individual fluid jetting apparatuses" (last 2 lines of Claim 1), these limitations have not been given patentable weight because the limitations are a future event and do patentably further limit or effect the claimed

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recited steps above in their present tense. Furthermore, the nozzle part, membrane and heat driving part, as a continuous piece, is capable of being separated into the formation of multiple of fluid jetting apparatuses, as suggested by Leban (at col. 7, lines 43-47).

Regarding Claim 19, Leban further teaches the following: forming a nozzle plate 14 on a first substrate 34 in which both of the elements constitute the nozzle part; forming jetting fluid barriers (layer 22) on the nozzle plate; forming jetting fluid chambers 32 within the jetting fluid barriers; forming a first reinforcement element (additional layer 52 shown in the embodiment of Fig. 3C); and forming nozzles 20 in the nozzle plate. The claimed "spinning process" of Leban is broadly encompassed by the nozzle plate 14 of the nozzle part being formed by a coating technique of *spinning* or spraying (discussed at col. 4, lines 56-61) together with the fluid jetting barriers 22 being formed by etching (discussed at col. 5, lines 33-39).

Leban does not teach that the wafer is made of the material of silicon.

Baise teaches that it is known in the art of spinning processes, i.e. spin coatings, to form polymeric layers on a substrate wafer made of silicon material (see col. 1, lines 49-53). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the nozzle part material of Leban on a substrate wafer made of silicon material, as taught by Baise, for the purpose of performing an equivalent spinning process of spin coating.

15. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leban in view of Baise, as applied to Claim 17 above, and further in view of Pan 4,894,664.

Leban, as modified by Baise, discloses the claimed manufacturing method as previously discussed including the step of forming electrodes (electrical conductors) and heat elements (heat resistors 36) on a substrate wafer 34 (see col. 5, line 60 to col. 6, line 5 of Leban). The modified

Leban method does not teach that the substrate wafer is made of *silicon* material as well as the steps of forming driving fluid barriers on the electrodes and the heat elements, and forming driving fluid chambers in the driving fluid barriers.

Pan teaches a process of manufacturing a thermal fluid jetting apparatus of forming a heat driving part (substrates 40, 10) in which driving fluid barriers (beams 12) are formed on both electrodes (conductive layers 23, 27) and heat driving elements (resistive layers 15). The driving fluid chambers are read as the passageways in-between the driving fluid barriers (beams 12 shown in Fig. 3). The benefits of such a process above provides a fluid jetting apparatus with increased reliability with a longer life of heat driving elements and smoother ink flow (see col. 1, lines 48-52).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have improved the heat driving part of the modified Leban method by including the process of forming driving fluid barriers and driving fluid chambers, as taught by Pan, to positively provide an overall fluid jetting apparatus having increased reliability with a longer life of heat driving elements and smoother ink flow.

16. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leban in view of Pan, as applied to claim 17 above, and further in view of Campanelli.

Leban, as modified by Pan, teaches the claimed manufacturing method as previously discussed including the suggestion of forming a plurality of fluid jetting apparatuses (at col. 7, lines 43-48 of Leban). The modified Leban method does not teach splitting the adhered nozzle part, membrane, and heat driving part into separate fluid jetting apparatuses.

Campanelli, as relied upon above, teaches batch fabrication of a plurality fluid jetting apparatuses in which each fluid jetting apparatus is formed into a continuous wafer or continuous piece. Subsequently, Campanelli splits the continuous wafer or continuous piece into a plurality of fluid jetting apparatuses by utilizing a dicing blade to ultimately provide an inexpensive manufacturing process for creating high quality fluid jetting apparatuses (see col. 9, lines 8-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have improved the modified Leban method by batch fabrication of the fluid jetting apparatuses, as taught by Campanelli, to positively provide an inexpensive manufacturing process for creating high quality fluid jetting apparatuses.

17. Claims 27, 30 and 42, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Campanelli and Hawkins' 572 and Torpey et al 4,638,337, in view of Baise et al.

It is noted that Hawkins' 572 and Torpey are each incorporated by reference in the disclosure of Campanelli (see Campanelli at col. 4, lines 65-67).

With respect to Claim 27; Campanelli and Hawkins' 572, as relied upon above and repeated here, each disclose the claimed manufacturing method comprising: forming a nozzle part (channel plate 31) on a first substrate of silicon wafer (see Hawkins' 572, Fig. 6A); forming a polymeric membrane (polymer layer 58 in Campanelli's Fig. 2); forming a heat driving part (heating element wafer 36) on a third substrate of silicon wafer (see Hawkins' 572 Fig. 5); adhering the nozzle part, membrane and heat driving part to form the fluid jetting apparatuses as a continuous piece (shown in Campanelli's Fig. 2), which will eventually be separated into individual fluid jetting apparatuses.

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Regarding Claim 30, Torpey teaches that forming electrodes 33 and heat elements 34 on the third substrate of the silicon wafer 36 (shown in Fig. 5) can be formed by a photolithographic process of patterning (see col. 7, lines 43+).

Regarding Claim 42, Campanelli further teaches splitting of the nozzle part, heat driving part and membrane, assembled together in the form of the continuous piece (shown in Fig. 2) by a dicing blade 20 (shown in Fig. 3) to form separate fluid jetting apparatuses.

Campanelli, Hawkins'572, or Torpey, each do not teach that a spinning process forms the nozzle part on the first substrate and that the same spinning process forms a membrane on the second substrate.

Baise teaches the general concept that to form more than one part or device, an overall spinning process can involve spin coating each device or part with a coating of material on a substrate of silicon material for each respective device or part (see col. 1, lines 58+). An advantage of Baise's spinning process provides for better adhesion between the coated layers (see col. 1, lines 8-10).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified either Campanelli, Hawkins'572, or Torpey, by utilizing a spinning process of forming the nozzle part on a first substrate of a silicon wafer and forming the membrane on a second substrate of a silicon wafer, as taught by Baise, to positively provide better adhesion between the layers.

Response to Arguments

18. Applicant's arguments filed 10/17/01 (Paper No. 16) have been fully considered but they are not persuasive.

In regards to the merits of Leban, as applied in the rejection of Claim 17 above, the applicants contend that Leban does not teach adhering the membrane to the heat driving part to form the fluid jetting apparatuses as a continuous piece to be separated into separate fluid jetting apparatuses.

The examiner most respectfully traverses. Based on the discussion above (in paragraph 14), Leban explicitly suggests that multiple fluid jetting apparatuses (at col. 7, lines 43-47) can be formed which are *capable* of being separated in a future event and that the nozzle part, membrane and heat driving part are formed as one, integral continuous piece (as shown in either one of Figures 1H, 2B or 4).

Allowable Subject Matter

19. Claims 13-16 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

20. Claims 21 and 24 are allowed.

Conclusion

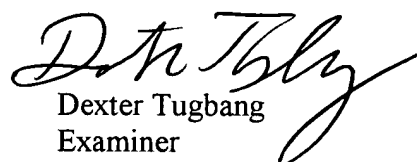
21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dexter Tugbang whose telephone number is 703-308-7599. The examiner can normally be reached on Monday - Friday 7:30 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 703-308-1789. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3590 for regular communications and 703-305-3588 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0858.


Dexter Tugbang
Examiner
Art Unit 3729

adt
January 3, 2002